Type. — University of Colorado. Collected on orange, at Fallbrook, California, by F. Austin. (Comm. Prof. C. F. Baker.)

The scales occur upon the bark in large numbers, and must be highly injurious. We had at first identified this species with *C. micropori* Marlatt, but after some correspondence with Mr. E. R. Sasscer we must follow his opinion, expressed on first seeing specimens, that it is distinct. The resemblance is certainly very close, but our insect has much larger dorsal pores, and the texture and size of the scale are different, that of *C. micropori* being very dense and chalky white. The second lateral lobe of *micropori*, as in our insect, seems to be normal, with a distinct outer lobule, notwithstanding the statement to the contrary in the original description. We are indebted to the kindness of Mr. Sasscer and Dr. Marlatt for specimens of *C. micropori*, and to Mrs. Sasscer for photographs of both species.

OBSERVATIONS ON TWO SPECIES OF HYALOPTERUS (APHIDIDÆ).*

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(WITH PLATE I.)

The only species of *Hyalopterus* Koch hitherto recognized by American writers is, so far as I know, *H. arundinis* Fabr. (*H. pruni* Fabr.). This is the well-known greenish, pulverulent aphid of an elongated form, with extremely small cornicles, which infests the under side of the leaves of plum trees. An account is here given of two other species which I believe have not been noticed before in the United States. *Hyalopterus aquilegiæ-flavus* (Kittel) which infests the columbine and rose in Europe, was found on these plants on the grounds of the Bussey Institution last fall. *H. dactylidis* n. sp. is an elongated yellowish aphid which I have taken on orchard grass, *Dactylis glomerata*, in the District of Columbia and at Forest Hills, Mass.

The winged and wingless viviparæ of *Hyalopterus aquilegiæ-flavus*

* Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 6.

were very numerous on the leaves of the garden columbine, *Aquilegia vulgaris* L., during September, 1908. They preferred the under surface of the leaves, although many individuals also occurred on the upper surface. A species of *Macrosiphum* was abundant on the stems of the same plants, and was also often mingled with the *Hyalopterus* in the same colonies.

On separating the specimens of these two species, which had been collected together on September 25 I was struck with the similarity of the *Hyalopterus* to specimens taken on rose bushes September 29, which were standing within a few rods of the columbines. These winged viviparæ proved to be identical in structure and markings with those from the columbines. There was one winged male of this genus among them, its conspicuous genitalia allowing no doubt of the sex. This discovery led me to suspect that the viviparæ collected on the roses might be sexuparæ from the *Aquilegias*. On looking up the literature I found that the migration from the rose to the columbine in May had been observed by Francis Walker in England fully sixty years ago. He states that it feeds "equally on the upper surface and on the under surface of the leaf, which often becomes red or purple from its injuries. It continues on that plant till the end of October." I did not notice that these aphids had any injurious effect on the leaves last fall. They are rather sluggish in their movements as compared with the active *Macrosiphums*. It is to this sluggishness that Walker doubtless refers in describing the species as having "a very quiet disposition."

On May 19, 1909, I found many green, lightly pulverulent aphids of this species on the tender shoots of the cinnamon rose, *Rosa cinnamomea* L. standing near the clumps of columbines. There were a few wingless adults beginning to deposit young, but most of the aphids were well advanced larvæ and these with the adults were in all probability the stem-mothers. The infested shoots and leaves did not show any injurious effect. Thorough examination was made of the columbines without finding any specimens of *Hyalopterus*, although there were many *Macrosiphums*. It is evident then that the hibernating eggs had been deposited on these roses last fall, which are therefore the primary host of the insect. We may expect to see the migrants from the roses establishing their broods on the columbines in June in this latitude. Evidently the winter eggs may, under some conditions, be deposited on the columbines, for Koch (1857) observed the isolated adult stem-mothers depositing larvæ on the leaves

of these plants in Germany towards the end of May and he noticed the winged viviparæ on the same hosts early in June. From these observations Mordwilko (1907) assumes that the species is not yet fixed in its migratory habits. This would not be at all surprising, since there are other migrating species which infest the secondary host much later in the season after the fall migrants have left for the primary host. The viviparæ, *e. g.*, of *Aphis bakeri* Cowen remained on the secondary host, red clover, until after freezing last fall at Forest Hills, and the true sexes and a few hibernating eggs were found on this plant late in October. I have also seen the adult oviparæ of *Myzus persicæ* Sulz. in October on radishes in Massachusetts.

The following points in the life-cycle of this species remain to be worked out. The migrations have never been actually demonstrated by artificial transfers. Mordwilko has shown that individuals from the columbines could be induced to live on the rose nine days in September, but he does not state that oviparæ or fertilized eggs were thus produced. These females have never been described. The species according to Walker may be injurious to columbine leaves, but no one else seems to have noticed such injuries.

This species is now known in the following countries: France, England, Germany, Italy, Belgium, Russia and the United States. It may be looked for anywhere in a temperate zone where the rose and columbine grow. It is most probable that it has been distributed over the world as hibernating eggs on the nursery stock of roses, which are, of course, imported during the dormant season.

Hyalopterus aquilegiæ-flavus (Kittel) was first described in the Mémoires Soc. Linn. Paris for 1826 under the name *Aphis Aquilegiæ flava* in such language as to allow no doubt of its identity. Schouteden (1906) restores Kittel's name, but drops *Aquilegiæ* on the ground that it is "inconvenient." I prefer, however, to retain the entire name supplying a hyphen to make it binominal in effect. The Law of Priority does not permit the rejection of original names because of inappropriateness and it gives no authority for rejection on account of inconvenience. Hyphenated compounds are recognized as binominal by the A. O. U. Code, Rev. Ed., 1908, p. xxxvi, and were used by Riley, Walsh and Osten-Sacken in describing gall insects.

Hyalopterus dactylidis sp. nov., as already stated, is the yellow aphid with blackish eyes which infests the blades of orchard grass. The insects arrange themselves on the dorsal surface in the furrow of

the leaves in single file, most frequently with their heads directed downwards. Isolated adults may often be seen with several pale yellowish larvæ in a row immediately behind their mothers.

I have collected this species at Ft. Myer, Va., in the District of Columbia and at Forest Hills, Mass. They were common where the grass was growing rankly, but were not easy to find elsewhere. The winged viviparæ were always extremely rare. Wherever I have found this species there seemed to be little need for the colonizing forms, since even the wingless viviparæ were not especially productive and the aphids never occurred in such numbers as to seriously injure the plants. The apical portion of many of the infested blades was yellowed chiefly along the midrib as if caused by an earlier attack of the insects when the leaves were more tender. This was especially noticeable on many blades which carried a long row of adults and larvæ stationed below the yellowed part. But many infested leaves did not appear to be injured at all. Thus the insects always had a luxuriant growth of foliage before them and were never in danger of extermination by the death of the host as are many other species which multiply so rapidly as to endanger their food supply. I observed this species at several points around Washington on orchard grass during June, July and August, 1907, all forms becoming very rare after June. Other collections were made as follows: Washington, D. C., March 27, 1908, on tall red-top, *Tricuspis sesterioides* by Mr. C. N. Ainslie, of the Bureau of Entomology; wingless adults and well-advanced larvæ. Tennallytown, D. C., March 30, 1908, orchard grass; fairly numerous, wingless adults, several pupæ, larvæ of all sizes. Forest Hills, Mass., September, October to November 30, 1908, orchard grass. Numerous until November. When last observed they were very rare and were still reproducing. Same locality — April 8, 1909, orchard grass, common; wingless adults and larvæ.

Thorough search was made for the true sexes and eggs at Forest Hills during November and December; none were found on any part of the plant or on the débris on the ground. This fact, together with the early collections of reproducing adults when it would seem impossible for them to have developed from hibernating eggs, led me to suspect that *Hyalopterus dactylidis* winters over as viviparæ. The true sexes may not exist in this species. It is possible that some other species may hibernate in the viviparous form even in Massachusetts on hardy grasses like orchard grass and quack. I have often observed

that aphids can stand considerable freezing in the fall, if their host is hardy, while other individuals of the same species on tender plants perish with the death of the host.

Since *Dactylis glomerata* is an introduced grass from Europe, the aphids must infest other grasses in this country from which they have gone over to orchard grass unless they were introduced with this plant; but the species has apparently not been noticed by European writers.

I have never seen this aphid attended by ants. Two species of hymenopterous parasites were reared from the wingless viviparæ. *Lysiphlebus cerasaphis* Fitch turns the host brown as in most parasitized aphids, while the other, *Ephedrus* sp., probably *plagiator* (= *parcicornis*) Nees causes the aphid to become coal black. They were collected at Forest Hills, Mass., May 22–23, 1909. I am indebted to Mr. C. T. Brues who kindly determined these parasites for me.

The wingless viviparæ of *Hyalopterus dactylidis* are remarkable in possessing a pronounced outpushing of the posterior lateral angle of the prothorax (Fig. 9). I have examined many specimens both living and in formalin and find this character normal and not especially variable. It is present, but less conspicuous, in the wingless viviparæ, fall forms, of *H. aquilegiæ-flavus* on columbine. It is not discernible in the youngest larvæ with 4-jointed antennæ, but is very evident in half grown larvæ (1 mm. long) with 5-jointed antennæ. Judging from the few specimens of the winged viviparæ which I have seen the third discoidal is apt to be very variable. I have at hand only nine specimens, three of which have the usual type of venation in the *Aphidinæ* on both wings (Fig. 10). The other six are as follows:

(*a*) One wing with unbranched third discoidal as in *Pemphigus*, the other wing with irregular atrophied branches (Fig. 10, *c–d*).

(*b*) Third discoidal 2-forked in one wing, but 1-forked in the other as in *Toxoptera* (Fig. 10, *a*).

(*c*) Two specimens with all the third discoidals 2-forked, the second fork close to the margin as in *Aphis* (*Siphocoryne*) *avenæ* Fabr. (Fig. 10, *b*). The vein figured also shows a supernumerary branch near the second fork.

(*d*) One vein single, the other 1-forked.

(*e*) Both third discoidals 1-forked, but in one wing the first branch

is lost, in the other the second branch. Fig. 10, *e–f*, represents two stages in the reduction of the upper branch of the second fork.

In other respects this species is not especially variable. While studying it at Washington I noticed several other examples with the third discoidal 1-forked, reminding one of the normal venation in *Toxoptera*. I noticed that the single forked third discoidal was a frequent variation in *Aphis* (*Siphocoryne*) *avenæ* which I collected on wheat at several points in Oklahoma and Georgia in the fall of 1907.

The following descriptions are all from balsam mounts. No color notes were made of the *H. aquilegiæ-flavus* collected in the fall. The colors of all other forms are from the living insects, high power hand lens, daylight. The bodies of these aphids preserved in 70 per cent. alcohol and mounted with the usual technique are not shrunken enough to be unfit for measurements judging by comparison with formalin material. Measurements at the best are only approximate, the size depending greatly on the supply of food and other conditions. For this reason I do not see the necessity for measuring many specimens. I have adopted the practice of picking out two of the smaller specimens, two typical and two of the largest from a large number collected, and thus the average size can be obtained accurately enough for systematic purposes. Whole mounts of *H. aquilegiæ-flavus* usually show a flat vertex; whether the median ocellus is visible or not on the vertex depends, of course, on the position of the object.

Hyalopterus aquilegiæ-flavus (Kittel).

Aphis Aquilegiæ flava sp. nov., Kittel, Mém. Soc. Linn. Paris, Vol. 5, 1827, p. 48. On leaves of *Aquilegia vulgaris* L., France. Description of winged form. (The short cornicles, long cauda, dark bands on the abdomen and the oval shape are sufficient evidence that this is the same as Walker's species.)

Hyalopterus flavus Kittel, Schouteden, H., Cat. d. Aphid. de Belg., Vol. 12, 1906, p. 230. Rose and *Aquilegia vulgaris* in Belgium. Synonomy; restores Kittel's name in part.

Hyalopterus aquilegiæ n. sp, Koch, C. L. Pflanzenläuse, 1857, pp. 19–20, pl. 4, figs. 25–26. Descriptions and colored figures of winged and wingless viviparæ Germany; stem-mothers (Altmütter) isolated on under side of leaves of *Aquilegia vulgaris* towards the end of May, winged viviparæ appearing early in June. (Evidently then, the hibernating eggs must have been laid on this host without a migration.)

Aphis trirhoda n. sp., Walker, Francis, Ann. Mag. Nat. Hist. (London), Vol. 4 (2d ser.), 1849, pp. 45–46. Descriptions of winged and wingless viviparæ. Migration from rose to columbine in May. Brief description of winged male.

Hyalopterus trirhoda (Walker) Passerini, G., Aphididæ Italicæ (Archivio per la Zool. l'Anat. e. la Fisiol., Modena, Vol. 2, fasc. 2), 1863, pp. 149, 150. Italy; *Aquilegia vulgaris* in summer and *Rosa indica* and *R. gallica* in autumn. Differen-

tial characters of winged and wingless viviparæ, and mention of winged male as a known form.

Passerini, G., Flora degli Afidi Ital. (Bull. Ent. Soc. Ital., Vol. 3), 1871, pp. 150, 336. *Aquilegia vulgaris* in summer; Italy, also on *Rosa indica* and *R. gallica* in summer.

Buckton, G. B., Brit. Aphid., Vol. 2, 1879, pp. 114–115, pl. 77, figs. 1–4. *Aquilegia vulgaris* June to September, England; descriptions and colored figures of winged and wingless vivipara and pupa, line figure of antenna of winged vivipara. *H. aquilegiæ* Koch = *Aphis trirhoda* Walker.

Del Guercio, G., Prospetto dell' Afidofauna Ital. (Nuov. Relaz. R. Staz. Ent. Agrar., Firenze (1), No. 2), 1900, pp. 146, 147. From Passerini.

Warren, Ernest, Biometrika (London), Vol. 1, No. 2, 1902, pp. 129–154. On variation and inheritance in the parthenogenetic generations.

Mordwilko, A., Beiträge zur Biol. d. Pflanzenläuse (Biol. Centralbl., Bd. 27, No. 24), 1907, pp. 815–816. Reviews Passerini and Koch. Mordwilko collected wingless viviparæ and their larvæ on *Rosa centifolia* at Warsaw, Russia, May 20, old style (June 1, new style), 1898, and winged viviparæ were observed June 18 (n. St.). The last week in July the wingless viviparæ and occasional winged viviparæ on the leaves of *Aquilegia*. On September 5, 1903, aphids were transferred from columbine to the rose on which they lived until September 14. (He does not state whether they deposited oviparæ, this experiment did not therefore prove their migration.) Sexuparæ and the true sexes can be found on rose in the fall. *H. trirhodus* is a polyphagus species, judging from Koch's observation of the stem-mothers on columbine in May.

Winged vivipara from *Aquilegia:* Head blackish (Fig. 3); antennæ (Fig. 4) dusky, usual number of sensoria on III 80–90 (62, III), each sensorium on a pronounced tubercle, sensoria on all aspects of the joint, most numerous on posterior aspect, but fewer in number on anterior aspect, the other joints without sensoria, except the usual ones on V and VI. Eyes blackish red; beak passing anterior margin of mesosternum but not attaining transverse sternal suture. Pronotum dusky, lateral tubercle absent, represented by a short seta; lobes black, lateral plates, mesosternum and metasternum dark brownish or blackish; forewing, Fig. 2, veins stout, venation not especially variable; legs yellowish brown, usual dark portions blackish. Abdomen (Fig. 5) yellowish; the squarish dusky patch sometimes represented by three broad transverse dusky bars; the last dusky bar (on 8th segment) often indistinct; no lateral tubercles. Cornicles (Fig. 8) and cauda (Fig. 6) pale yellowish or the cornicles translucent, the cauda with 8–10 lateral setæ.

Measurements: Length of body (less cauda) 1.907 mm. (1.74–2.08); greatest width of abdomen .888 (.783–1.00); antennæ (average III–filament inclusive) 1.537; III .806 (.774–.929); IV and V each .209 (.172–.241); VI (scape) .147 (.110–.172); filament .166 (.120–.189); forewing 3.12 (3.045–3.393); cornicle .103; cauda .220 (.206–.241).

Walker gives the colors of this form as follows: head, lobes of thorax, lateral and sternal plates, maculations of abdomen, antennæ, eyes, apex of beak, of femora and of tibiæ and the tarsi black; main body color pale greenish yellow, varying to dark green, cornicles and legs pale yellow. Koch's description is essentially the same.

Wingless vivipara.

Whole body yellowish; two dorso-lateral longitudinal rows of impressed dusky spots or short transverse lines, arranged segmentally in pairs, the first pair on the prothorax, the last pair on the sixth abdominal segment; otherwise without maculations. Antennæ without sensoria except the usual ones on V and VI, the third joint distinctly or slightly swollen on anterior aspect near the base, the entire appendage pale yellowish except the dusky sixth joint (including filament); eyes dark red; beak passes anterior margin of mesothorax, but does not attain mesocoxæ; *prothorax* with lateral margin angulate (Fig. 1); legs pale yellowish, only the tarsi dusky; cornicles usually with the apex brownish. Elsewhere as in winged vivipara.

Measurements: Length of body (less cauda) 1.965 mm. (1.783–2.175); greatest width of abdomen (3d segment) .983 (.870–1.044); antennæ (III–filament inclusive) 1.05; III .513 (.430–.601); IV .152 (.138–.172); V .146 (.138–.170); VI (scape) .111 (.103–.120); filament .129 (.120–.138); cornicle .086; cauda .268 (.223–.310).

Walker gives color of this form as follows: green, "covered with a white bloom," all appendages including cornicles and cauda whitish, eyes dark brown. Buckton describes it as yellowish green with the cauda yellow. Koch describes the whole body as whitish yellow to greenish; all appendages very pale yellowish. He figures this form with ten brownish transverse bars above beginning with the prothorax, one for each segment to the seventh abdominal inclusive.

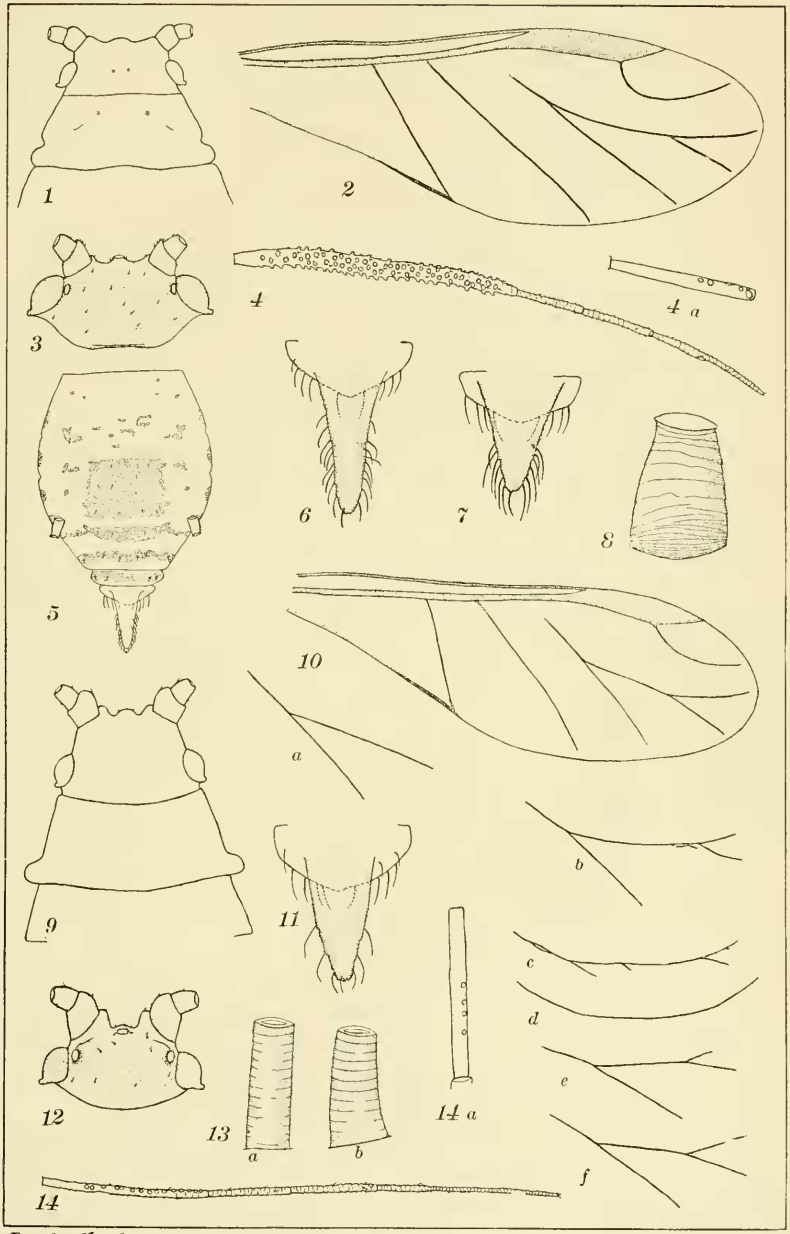
Wingless vivipara, rose, May 23.

Head yellowish green or whitish green; antennæ I–II concolorous, elsewhere whitish or whitish yellow except the greenish articulations between joints III–IV, IV–V, and the dusky or blackish filament, or distal half of scape of VI and filament; eyes black (even when dampened with alcohol, which ordinarily makes the "black" eyes of plant lice appear dark red); beak whitish, apical joint brownish; legs whitish or greenish white, tips of tibiæ brownish, tarsi dusky; prothorax not angulate; thorax and abdomen yellowish green, generally very lightly pulverulent; two longitudinal dorso-lateral rows of deep green marks or spots, one pair on each segment between the sutures beginning with the prothorax and ending with the 6th abdominal segment, those on the abdomen take the form of transverse bars which are usually not confluent on the meson, but sometimes extend clear across; cornicles pale greenish with brownish apical ring; cauda light yellowish. Ventral aspect green, unicolorous, distinctly pulverulent. Elsewhere as in the first described wingless vivipara.

Measurements: Length of body (less cauda) 1.914 mm. (1.74–2.088); greatest width of abdomen (2d and 3d segments) 1.087 (.957–1.218); antennæ (III–filament inclusive) 1.186, III .579 (.533–.637); IV .180 (.155–.206); V .172 (.155–.189); VI (scape) .123 (.120–.128); filament .132 (.120–.138); cornicle .091 (.086–.102); cauda .310 (.292–.327).

From 15 living specimens.

It will be seen from the above that the spring forms have broader abdomens and longer antennæ, cornicles and cauda than those on columbine in the fall.



Paul Hayhurst

Aphididæ.